UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,400	02/25/2004	Takayuki Isogai	1417-451	9810

23117 7590 04/22/2005

NIXON & VANDERHYE, PC
1100 N GLEBE ROAD
8TH FLOOR
ARLINGTON, VA 22201-4714

EXAMINER	
OH, TAYLOR V	

ART UNIT	PAPER NUMBER
1625	

DATE MAILED: 04/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/785,400	ISOGAI ET AL.	
	Examiner	Art Unit	
	Taylor Victor Oh	1625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 February 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

RV

Non-Final Rejection

The Status of Claims:

Claims 1-9 are pending.

Claims 1-9 have been rejected.

DETAILED ACTION

Priority

1. It is noted that the application is a continuation of PCT/JP02/08606 (08/27/2002); however, a foreign priority document , Japan 2001-259353 (08/29/2001) is not in the file.

Drawings

2. The drawing filed on 2/25/2004 is objected by the Examiner because there is a foreign letter on the top left hand side. This is improper. Therefore, an appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1-3 and 8-9, the phrase" screen-type" is recited. This expressions are vague and indefinite because the specification does not elaborate on what is meant by the phrase " screen–type". Therefore, an appropriate correction is required.

Claim Rejections - 35 USC § 103

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 1-9 are rejected under 35 USC 103 (a) as being unpatentable over Desai et al (US 5,653,673) in view of Bird Machine Co. (GB 1065,340) and David et al (Physics, 1978, p.102-103,174-176, and 223).

Desai et al teaches a screw conveyor centrifugal apparatus for separation of solids-liquid mixtures and internal washing of solids (see col. 1 ,lines 13-15). In addition, the detailed appearance of the typical screw conveyor centrifugal apparatus has depicted in Fig .1 and Fig. 3 in which the screw conveyor centrifugal apparatus comprises an outer rotating cylinder, screw conveyor with a cylindrical rotating shaft , a screw and a slurry supply pipe (see from col. 6 ,lines 54-67 to col. 7 , lines 1-25).

The Desai et al process is suitable for separation and recovery of solid crystalline chemical compounds from the liquids ; for example, aromatic acids including

terephthalic acid which can be formed a corresponding methyl substituted aromatic compound by liquid-phase oxidation with oxygen-containing gas in the presence of an oxidation catalyst (see col. 13 ,lines 41-50).

Furthermore, the solids-liquid feed used in the process have an average particle size of from 75 to 150 microns (col. 14, lines 17-21); the feed in the separating chamber is subjected to high centrifugal forces in the range of from 1,000 to 4,000 times a gravitational force(see col. 9 ,lines 43-47).

For a cleaning purpose inside the apparatus, liquid is delivered as wash to the interior of centrifuge through an annulus between stationary feed tube and stationary tube (see col. 7 , lines 37-38).

In addition, a plurality of disposed solids discharge ports or openings are provided adjacent an end wall on the tapered section of the bowl (16) (see col. 8 , lines 31-32).

However, the instant invention differs from the prior art in that the claimed screen-type is not disclosed; the screen has an opening size to allow escape of an amount of 1 to 40 % by weight of crystals; the residence time for the solid-liquid separation on the screen is from 2 to 20 seconds after the slurry passing through the

cleaning fluid supplied area; the opening size of the screen is not less than (B-10) μm and not more than (B+80) μm.

Bird Machine Co reference teaches a centrifugal separator for separating solid particles from liquid slurry and describes that the separator has a helical conveyor in combination with an imperforate conical bowl or combination of cylindrical and conical bowl for initial separation of solids from the liquid by drainage and a screen bowl for final separation (see page 1 , lines 11-18). The clear illustration of the centrifugal separator is described in Fig. 1.

Furthermore, the Bird Machine Co. has offered guidance that the size of the apertures in the screen portion of the bowl may be varied depending on the nature and particle size of the solids to be separated from the liquid feed slurry(page 2 ,lines 126-130); it can be controlled in order to allow a minimum size of the fine particles passing through the screen (page 3 ,lines 1-2).

Concerning the opening size of the screen to allow escape of an amount of 1 to 40 % by weight of crystals , the prior art is silent with respect to escape of an amount of 1 to 40 % by weight of crystals. However, it is possible to estimate how the amount of crystals will allow to pass through the opening size of the screen, since the particle size, the specific gravity of the particle, and the centrifugal force are directly related to one another and their respective values are known in the prior art ; for example, the prior art expressly teaches the average particle size of the solid in the range of from 75 to 150 microns (col. 14, lines 17-21) with the specific gravity(1.5) and

the speed of the centrifuge (3300 rpm) (see col. 14 , lines 15-16). According to the Physics text by David et al, centrifugal force is written as $F_{centrifugal\ force} = mv^2/r$ (see page 103, line 10) and $v=\omega r$ (see page 223, eqn. (11-8)) wherein $F_{centrifugal\ force}$ is a net force; m is a mass; v is a velocity ; r is radius of the cylinder ; and ω is an angular velocity (rpm).

The David et al , also, describes a reaction force related to the mass flow (see page 175-176) : a small portion of mass (dM) is ejected during a time interval (dt) when the original mass (M) sits on the screen for a short period of time in which its velocity becomes zero ; therefore, the overall reaction- force- equation becomes $F_{reaction} = v_{rel}\ dM/dt$ (see page 176, 21-22) wherein $F_{reaction\ force}$ is the reaction force when the mass (dM) is ejected during a time interval (dt); v_{rel} = a relative velocity with respect to the velocity of the original mass(M) ,which essentially becomes the velocity of the mass (m) during the centrifugal force. Thus, the relationship between their equations becomes the following: $F_{centrifugal\ force} = mv^2/r = F_{reaction\ force} = v_{rel}\ dM/dt$ where v is equal to v_{rel} .

From the analysis of these equations, it becomes clear that the centrifugal force is proportional to mass flow rate ; the more centrifugal force is applied to the mass, the faster the mass will flow through the screen. Thus, it is very plausible to figure out how much amount of crystals will pass through the opening size of the screen in a given time. Therefore, it would have been obvious to the skilled artisan to be motivated to estimate how the amount of crystals allowed to escape through the opening size of the screen by the routine experimentation .

With respect to the residence time for the solid-liquid separation on the screen, the limitation of a process with respect to ranges of pH, time and concentration does not impart patentability to a process when such values are those which would be determined by one of ordinary skill in the art in achieving optimum operation of the process. The residence time is well understood by those of ordinary skill in the art to be a result-effective variable, especially when attempting to control selectivity in a chemical process. Furthermore, the residence time is directly connected to the centrifugal forces; the higher centrifugal forces are applied to the screen, the shorter the residence time will be. In addition, the prior art expressly discloses that the feed in the separating chamber is subjected to high centrifugal forces in the range of from 1,000 to 4,000 times a gravitational force(see col. 9 ,lines 43-47). Therefore, it would have been obvious to the skilled artisan in the art to be motivated to control the residence time by selecting the suitable centrifugal force in order to achieve optimum operation of the process.

Regarding the claimed specific range of the opening size of the screen, the prior art are silent. However, Desai et al does show that the particle size can be in the range of from 75 to 150 microns (col. 14, lines 17-21), whereas the Bird Machine Co reference has offered guidance that the size of the apertures in the screen portion of the bowl may be varied depending on the nature and particle size of the solids. Therefore, it would have been obvious to the skilled artisan in the art to be motivated to adjust the size of the apertures in the screen depending on the nature and particle size of the solids taught by the Bird Machine Co in consideration of the Desai's et al

particle size.

The Desai et al process teaches the separation and recovery of solid crystalline aromatic acids formed by the liquid-phase oxidation of the corresponding methyl substituted aromatic compound by using the screw conveyor centrifugal apparatus; furthermore, it describes particularly that "a plurality of disposed solids discharge ports or openings are provided adjacent an end wall on the tapered section of the bowl (16)" (see col. 8 , lines 31-32). Similarly, Bird Machine Co reference does teach the screw conveyor centrifugal separator for separating solid particles from liquid slurry using the screen; also, the Bird Machine Co reference has offered guidance that the size of the apertures in the screen portion of the bowl may be varied depending on the nature and particle size of the solids.

Both prior art processes have been commonly involved in using the similar screw conveyor centrifugal apparatus between them with respect to separating solid particles from liquid slurry. Moreover, the Bird Machine Co reference has offered guidance that the size of the apertures can be controlled in order to allow a minimum size of the fine particles passing through the screen ,depending on the nature and particle size of the solids. Furthermore, the David et al gives guidance that the mass flow rate is controlled by the centrifugal force.

Therefore, it would have been obvious to the skilled artisan in the art to be motivated to incorporate the Bird Machine Co 's teachings of the adjustable size of the apertures in the screen depending on the nature and particle size of the solids in

combination of David's et al teaching into the Desai et al process in order to control the minimum size of the fine particles passing through the screen because the skilled artisan in the art would expect such combined operations to be successful and manageable as the guidance shown in the passages (page 2 ,lines 126-130) and (page 3 ,lines 1-2) of the Bird Machine Co prior art.

2. Claims 1-3 ,and 6-9 are rejected under 35 USC 103 (a) as being unpatentable over Johannemann et al (US 5,971,907) in view of Bird Machine Co. (GB 1065,340) and David et al (Physics, 1978, p.102-103,174-176, and 223).

Johannemann et al teaches a screw conveyor centrifugal apparatus for separation of solids-liquid mixtures (see col. 1 ,lines 13-15). In addition, the detailed appearance of the typical screw conveyor centrifugal apparatus has depicted in Fig .1 and Fig. 2 in which the screw conveyor centrifugal apparatus comprises an outer rotating cylinder, screw conveyor with a cylindrical rotating shaft , a screw (see col. 7 ,lines 37-60) and a slurry supply pipe (see col. 8 ,lines 32-35).

The Johannemann et al process is suitable for separation and recovery of solid crystalline chemical compounds from the liquids ; for example, terephthalic acid which can be formed by the oxidation of para-xylene (see col. 1 ,line 30) using air or other

source of dioxygen and catalyzed by one or more heavy metal compounds (see col. 3 ,lines 26-32).

Furthermore, the solids-liquid feed used in the process have an average particle size of from 75 to 150 microns (col. 9, lines 40-42); a series of runs is carried out at a rotating speed of 1400-1600 rpm (see col. 9 ,lines 40-53).

In addition, a plurality of disposed solids discharge ports or openings are provided adjacent an end wall on the tapered section of the bowl (16) (see col. 7 , lines 44-45).

However, the instant invention differs from the prior art in that the claimed screen-type is not disclosed; the screen has an opening size to allow escape of an amount of 1 to 40 % by weight of crystals; the opening size of the screen is not less than (B-10) μm and not more than (B+80) μm.

Bird Machine Co reference teaches a centrifugal separator for separating solid particles from liquid slurry and describes that the separator has a helical conveyor in combination with an imperforate conical bowl or combination of cylindrical and conical bowl for initial separation of solids from the liquid by drainage and a screen bowl for final separation (see page 1 , lines 11-18). The clear illustration of the centrifugal separator is described in Fig. 1.

Furthermore, the Bird Machine Co. has offered guidance that the size of the apertures in the screen portion of the bowl may be varied depending on the nature and particle size of the solids to be separated from the liquid feed slurry (page 2 ,lines 126-130); it can be controlled in order to allow a minimum size of the fine particles passing through the screen (page 3 ,lines 1-2).

Concerning the opening size of the screen to allow escape of an amount of 1 to 40 % by weight of crystals , the prior art is silent with respect to escape of an amount of 1 to 40 % by weight of crystals. However, it is possible to estimate how the amount of crystals will allow to pass through the opening size of the screen, since the particle size, the specific gravity of the particle, and the centrifugal force are directly related to one another and their respective values are known in the prior art ; for example, the prior art expressly teaches the average particle size of the solid in the range of from 75 to 150 microns (col. 14, lines 17-21) with the specific gravity(1.5) and the speed of the centrifuge (3300 rpm) (see col. 14 , lines 15-16). According to the Physics text by David et al, centrifugal force is written as $F_{\text{centrifugal force}} = mv^2/r$ (see page 103, line 10) and $v=\omega r$ (see page 223, eqn. (11-8)) wherein $F_{\text{centrifugal force}}$ is a net force; m is a mass; v is a velocity ; r is radius of the cylinder ; and ω is an angular velocity (rpm).

The David et al , also, describes a reaction force related to the mass flow (see page 175-176) : a small portion of mass (dM) is ejected during a time interval (dt) when the original mass (M) sits on the screen for a short period of time in which its velocity becomes zero ; therefore, the overall reaction- force- equation becomes F

$_{reaction}$ =v_{rel} dM/dt (see page 176, 21-22) wherein $F_{reaction\ force}$ is the reaction force when the mass (dM) is ejected during a time interval (dt); v_{rel} = a relative velocity with respect to the velocity of the original mass(M) ,which essentially becomes the velocity of the mass (m) during the centrifugal force. Thus, the relationship between their equations becomes the following: $F_{centrifugal\ force} = mv^2/r = F_{reaction\ force} = v_{rel}\ dM/dt$ where v is equal to v_{rel} .

From the analysis of these equations, it becomes clear that the centrifugal force is proportional to mass flow rate ; the more centrifugal force is applied to the mass, the faster the mass will flow through the screen. Thus, it is very plausible to figure out how much amount of crystals will pass through the opening size of the screen in a given time. Therefore, it would have been obvious to the skilled artisan in the art to be motivated to estimate how the amount of crystals allowed to escape through the opening size of the screen by the routine experimentation.

Regarding the claimed specific range of the opening size of the screen, the prior art are silent. However, Johannemann et al does show that the particle size can be in the range of from 75 to 150 microns (col. 9, lines 40-42) , whereas the Bird Machine Co reference has offered guidance that the size of the apertures in the screen portion of the bowl may be varied depending on the nature and particle size of the solids. Therefore, it would have been obvious to the skilled artisan in the art to be motivated to adjust the size of the apertures in the screen depending on the nature and particle size of the solids taught by the Bird Machine Co in consideration of the

Johannemann's et al particle size.

The Johannemann et al process teaches the separation and recovery of solid crystalline aromatic acids formed by the liquid-phase oxidation of the corresponding methyl substituted aromatic compound by using the screw conveyor centrifugal apparatus; furthermore, it describes particularly "solids-discharge port (16) (see col. 7 , lines 44-45). Similarly, Bird Machine Co reference does teach the screw conveyor centrifugal separator for separating solid particles from liquid slurry; also, the Bird Machine Co reference has offered guidance that the size of the apertures in the screen portion of the bowl may be varied depending on the nature and particle size of the solids.

Both prior art processes have been commonly involved in using the similar screw conveyor centrifugal apparatus between them with respect to separating solid particles from liquid slurry. Moreover, the Bird Machine Co reference has offered guidance that the size of the apertures can be controlled in order to allow a minimum size of the fine particles passing through the screen ,depending on the nature and particle size of the solids. Furthermore, the David et al gives guidance that the mass flow rate is controlled by the centrifugal force.

Therefore, it would have been obvious to the skilled artisan in the art to be motivated to incorporate the Bird Machine Co 's teachings of the adjustable size of the apertures in the screen depending on the nature and particle size of the solids in combination of David's et al teaching into the Johannemann et al process in order to

control the minimum size of the fine particles passing through the screen because the skilled artisan in the art would expect such combined operations to be successful and manageable as the guidance shown in the passages (page 2 ,lines 126-130) and (page 3 ,lines 1-2) of the Bird Machine Co prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Taylor Victor Oh whose telephone number is 571-272-0689. The examiner can normally be reached on 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cecilia Tsang can be reached on 571-272-0562. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

4/11/05